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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Wayne O. Duescher	Examiner:	Lazorcik, Jason L.
Serial No.	10/824,107	Group Art Unit:	1731
Filed:	April 14, 2004	Docket No.:	638.014US1
Title:	ABRASIVE AGGLOMERATE RAISED ISLAND ARTICLES		

MAIL STOP APPEAL BRIEF - PATENTS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

The following documents are hereby submitted:

☒ Second Replacement Brief – In Response to Notice of Non-Compliant Appeal Brief of 25 September 2007 (57 pages)
☒ Transmittal Sheet
☒ Return postcard

The fee for the Appeal Brief was paid for when the original Appeal Brief, dated 29 May 2007, was submitted to the USPTO. Please consider this a PETITION FOR EXTENSION OF TIME for sufficient number of months to enter these papers if an additional extension of time is deemed necessary by the Office. Authorization is hereby given to charge Deposit Account Number 50-1391 if such additional extension is necessary.

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By: [signature]
Atty: Mark A. Litman
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CERTIFICATE UNDER 37 C.F.R. 1.8: The undersigned hereby certifies that this Transmittal Letter and the paper, as described herein, are being deposited in the United States Postal Service, as first class mail, with sufficient postage, in an envelope addressed to: Mail Stop Appeal Brief – Patents, Commissioner for Patents, PO Box 1450, Alexandria, VA 22313-1450 on 23 October 2007.

Mark A. Litman
Name

[signature]
Signature

S/N 10/824,107 **PATENT**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

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Alexandria, VA22313-1450

Sir:

SECOND REPLACEMENT BRIEF – IN RESPONSE TO NOTICE OF NON-COMPLIANT APPEAL BRIEF OF 25 SEPTEMBER 2007

The U.S. Patent and Trademark Office is hereby authorized to debit any costs and fees associated with this Petition to Deposit Account No. 50-1391. Appellant(s) is submitting this single copy of the Appeal Brief in Compliance with the requirements of 37 CFR 41.37(c). Appellant requests a personal appearance at the Board of Appeals, but will defer payment of the fee until after receipt of the Examiner's Amendment. **The Appeal Brief Fee has already been paid.**

CERTIFICATE UNDER 37 C.F.R. 1.8: The undersigned hereby certifies that this Transmittal Letter and the paper, as described herein, are being deposited in the United States Postal Service, as first class mail, with sufficient postage, in an envelope addressed to: MAIL STOP: APPEAL BRIEF - PATENTS, P.O. BOX 1450, Commissioner for Patents, Alexandria, VA 22313-1450 23 OCTOBER 2007.

Mark A. Litman
Name

Signature

TABLE OF CONTENTS

REAL PARTY IN INTEREST

The real party in interest in this Appeal is the assignee of the full right, title and interest in this Application, Wayne O. Duescher, the inventor of this Application.

RELATED APPEALS AND INTERFERENCES

The Appellant(s), the legal representative prosecuting this application and Appeal, and the assignee are not aware of any Appeals or Interferences that will directly affect or have a bearing on the Board's of Patent Appeals and Interferences decision in this pending Appeal.

STATUS OF CLAIMS

Claims 1 and 22-31 have been withdrawn from consideration as directed towards a non-elected invention and are not involved in this appeal, being directed towards non-elected subject matter.

Claims 2-21 are involved in this Appeal. Claims 2-21 are finally rejected and present in this appeal. The basis of the rejection of each claim in this Appeal is identified below.

Claims 2-21 have been rejected as follows.

1) Claim 9 has been rejected under the **first paragraph** provisions of 35 USC 112 as containing matter which was not originally described in the specification.
2) Claims 2, 3, 6, 8, 11, 12, 15 and 17 have been finally rejected under 35U.S.C § 102(b) as being anticipated by Berg (5,984,988).
3) Claims 4 and 13 have been finally Rejected under 35 U.S.C. 103(a) as unpatentable over Berg (5,984,988) in light of Howard (3,916,584) and in further view of the rejections of Claims 2 and 11. The use of dehydrating liquid is commonly practiced and well known in the art.
4) Claims 5 and 14 have been finally rejected under 35U.S.C. 103(a) as unpatentable over Berg (5,984,988) in light of Eisenberg (4,393,021) and in further view of the rejections of Claims 2 and 11.

5) Claims 7 and 16 have been finally rejected under 35U.S.C. 103 (a) as unpatentable over Berg (5,984,988) in light of Culler (6,521,004) and the Quadro Engineering Incorporated Comil® product description.

6) Claims 9 and 10 have been rejected under 35U.S.C. 103(a) as unpatentable over Berg (5,984,988) in view of Mathews (3,838,998).

7) Claims 18 has been rejected under 35U.S.C. 103(a) as unpatentable over Berg (5,984,988) in view of Cai (Phys Rev Lett. 2202 Dec:89(23):235501.) Cai indicates that "gamma-alumina is known to transform to theta-alumina and finally to alpha-alumina upon thermal treatment. It is asserted to be obvious to choose gamma-alumina as taught by Cai from the Claim 18 material list to be converted into alpha alumina in the thermal treatment set by Berg.

8) Claims 19 and 20 Rejected under 35U.S.C. 103(a) as unpatentable over Berg (5,984,988) in view of Culler (6,521,004).

9) Claim 21 has been rejected under 35U.S.C. 103(a) as unpatentable over Berg (5,984,988) in view of in view of Ramanath (5,834,569).

STATUS OF AMENDMENTS

In the Amendment After Final Rejection mailed 29 March 2007, a single amendment to claim 9 was proposed. The Patent and Trademark Office indicated that the amendment **would be entered** in the Advisory Action mailed April 12, 2007. All other Amendments have been entered in due course in the prosecution of this Application.

SUMMARY OF CLAIMED SUBJECT MATTER

Claims 2 and 11 are the only independent claims at issue in the application on Appeal. These claims cover processes for making spherical beads, usually as an abrasive material. Although the Office Action has requested that "Independent claims 1, 2, 11, 30 and 31 be mapped, as only Independent claims 2 and 11 are at issue in this appeal, mapping of the other claims is believed unnecessary. A brief mapping for those claims is provided at the end of the detailed mapping of claims 2 and 11.

The subject matter and mapping of Independent Claim 2

A process of making spherical beads comprising: **[Page 221, lines 25-29; original claim 2; Abstract, lines 1-2; page 236, line 13 through page 2367, line 13]**

a) using a cell sheet wherein the cell sheet has a array of cell sheet through holes; **[Page 222, lines 6-15; page 236, line 13 through page 2367, line 13]**

b) the cell sheet through holes each have a cross sectional area; **[Page 222, lines 6-15; page 236, line 13 through page 2367, line 13]**

c) the cell sheet having a nominal thickness; **[Page 222, lines 6-15; page 85, lines 11-16; page 236, line 13 through page 2367, line 13]**

d) the cell sheet holes form cell sheet volumes wherein a cell sheet volume is equal to the cell sheet through hole cross sectional area multiplied by the cell sheet thickness; { **page 236, line 13 through page 2367, line 13**}

e) mixing materials into a liquid solution, the mixture solution comprising an inorganic oxide or a combination of inorganic oxides, and water, solvents or a combination thereof; **[page 236, line 13 through page 2367, line 13]**

f) filling the cell sheet holes with the liquid mixture solution to form mixture volumes wherein the volume of mixture solution contained in each mixture volume is equal to the cell sheet volume; **[page 236, line 13 through page 2367, line 13]**

g) ejecting the liquid mixture volumes from the cell sheet by subjecting the liquid mixture solution contained in each cell to an impinging jet of fluid wherein the impact of the impinging jet of fluid dislocates the liquid mixture volumes from the cell sheet thereby forming independent mixture solution lump entities; **[page 236, line 13 through page 2367, line 13]**

h) wherein the ejected independent liquid mixture solution lump entities are shaped into independent spherical entities by force comprising liquid mixture solution surface tension forces; **[page 236, line 13 through page 2367, line 13]**

i) the independent spherical entities are introduced into and subjected to a solidification environment wherein the independent spherical entities become solidified to form loose, green, spherical beads; and **[page 236, line 13 through page 2367, line 13]**

j) firing the loose, green, spherical beads at high temperatures to produce beads.

(Original Claim 3 [misnumbered, *sic 2*[; page 221, line 24 – page 222, line 25; paragraphs 0417-0427 of Published Application; page 236, line 13 through page 2367, line 13).

The subject matter and mapping of Independent Claim 11

A process of making spherical abrasive agglomerates comprising: **[Page 221, lines 25-29; original claim 2; Abstract, lines 1-2; Page 237, line 14 through page 238, line 12]**

a) using a cell sheet wherein the cell sheet has a array of cell sheet through holes; . **[Page 222, lines 6-15; Page 237, line 14 through page 238, line 12]**

b) the cell sheet through holes each have a cross sectional area; . **[Page 237, line 14 through page 238, line 12]**

c) the cell sheet having a nominal thickness; . **[Page 237, line 14 through page 238, line 12]**

d) the cell sheet holes form cell sheet volumes wherein a cell sheet volume is equal to the cell sheet through hole cross sectional area multiplied by the cell sheet thickness; . **[Page 237, line 14 through page 238, line 12]**

e) mixing materials into a liquid solution, the liquid mixture solution comprising abrasive particles, an inorganic vitrifiable oxide or a combination of inorganic vitrifiable oxides, and water or solvents or a combination thereof; . **[Page 237, line 14 through page 238, line 12]**

f) filling the cell sheet holes with the liquid mixture solution to form mixture volumes wherein the volume of mixture solution contained in each mixture volume is equal to the cell sheet volume; i) ejecting the liquid mixture volumes from the cell sheet by subjecting the mixture solution contained in each cell to an impinging jet of fluid wherein the impact of the impinging jet of fluid dislocates the liquid mixture volumes from the cell sheet thereby forming independent liquid mixture solution lump entities; . **[Page 237, line 14 through page 238, line 12]**

g) wherein the ejected independent liquid mixture solution lump entities are shaped into independent spherical entities by at least mixture solution surface tension forces; . **[Page 237, line 14 through page 238, line 12]**

h) the independent spherical entities are introduced into and subjected to a solidification environment wherein the independent spherical entities become solidified to form loose green agglomerates; and . **[Page 237, line 14 through page 238, line 12]**

i) firing the green agglomerates at high temperatures to produce spherical abrasive agglomerates. **[Page 237, line 14 through page 238, line 12]**

Nearly literal antecedent basis for WITHDRAWN claim 1

1. A flexible abrasive sheet disk article comprising: a) a backing sheet comprising a polymer; b) the backing sheet having a disk shape, the disk shape having an outer radius; c) the disk shape having an annular distribution of abrasive on a surface, the annular distribution having an inner radius of an abrasive coated annular band that is less than 85% of an outer radius of the abrasive coated annular band; d) the annular distribution of abrasive comprising at least a monolayer of abrasive particles or composite erodible abrasive agglomerates, the at least a monolayer being resin bonded onto the surface of the disk backing sheet; and e) an outer annular border gap area located between the outer radius of the coated abrasive annular band of coated abrasive and an outer radius of the disk article, the gap area being free of coated abrasive wherein the border gap area has a radial width of from 0.1% to 10.0% of the abrasive disk article radius.**[Page 235, line 25 through page 236, line 12.]**

Nearly literal antecedent basis for WITHDRAWN claim 30

> 30. (WITHDRAWN) An abrasive article wherein the standard deviation of the average size of the spherical abrasive agglomerates is less than 20% of the average abrasive agglomerate size.

can be found at **Page 150, line 1 through page 151, line 25.**

Nearly literal antecedent basis for WITHDRAWN claim 31

> 31. (WITHDRAWN) An abrasive article wherein the standard deviation of the average size of the spherical abrasive agglomerates is less than 10% of the average abrasive agglomerate size.

can be found at **Page 150, line 1 through page 151, line 25.**

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Solely for the purposes of expediting this Appeal and complying with the requirements of 37 C.F.R. 1.192(c)(7), the following grouping of claims is presented. This grouping is not intended to constitute any admission on the record that claims within groups may or may not be independently asserted in subsequent litigation or that for any judicial determination other than this Appeal, the claims may or may not stand by themselves against any challenge to their validity or enforceability.

1) Claim 9 has been rejected under the **first paragraph** provisions of 35 USC 112 as containing matter which was not originally described in the specification.
2) Claims 2, 3, 6, 8, 11, 12, 15 and 17 have been finally rejected under 35U.S.C § 102(b) as being anticipated by Berg (5,984,988).
3) Claims 4 and 13 have been finally Rejected under 35U.S.C. 103(a) as unpatentable over Berg (5,984,988) in light of Howard (3,916,584) and in further view of the rejections of Claims 2 and 11. The use of dehydrating liquid is commonly practiced and well known in the art.
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ARGUMENT

1) Claim 9 has been rejected under 35 USC 112, first paragraph as containing subject matter not originally disclosed.

The subject matter of this claim that was the basis of this rejection is:

"foaming agents, gas-forming substances, and/or blowing agents."

Claim 9 has been amended and the amendment entered, removing specifically that material regarded as unsupported and leaving the material specifically identified as supported. This amendment therefore raises no new issues nor requires further search or examination as the Examiner has already considered the remaining material and the subject matter.

2) Claims 2, 3, 6, 8, 11, 12, 15 and 17. have been rejected under 35U.S.C § 102(b) as being anticipated by Berg (5,984,988).

RESPONSE TO THE ARGUMENTS OF THE EXAMINER

The Examiner has taken a formal position on the record that "As indicated in the previous office action, although a portion of the liquid is removed from the entrained dispersion, even in the most extreme scenario presented the mixture volumes **still contain approximately 30% liquid by weight**. Since liquid remains in the mixture volumes, said mixture volumes are rightfully considered, by the broadest reasonable interpretation of the term, to be "**liquid mixture volumes**".

THIS POSITION IS ABSOLUTELY WRONG AND WILL BE SHOWN TO BE ABSOLUTELY WRONG BY THE FOLLOWING DISCUSSION.

First, the claims require the product recited to be a liquid, not merely contain something that under other circumstances could be a liquid. The material of Berg, as clearly shown herein, is a solid, even if it contains 30% water.

Water is not necessarily a liquid. Even in pure form, 100% water at -40°C is not a liquid. To assert that everything with 30% water in it is a liquid is clear error.

The product of Berg that is dried to at most 30% water is more than just dried is required to be gelled by the process **before expulsion from the mold**. Gelled products, as well known to anyone who has seen Jell0® dessert mixes, contain 90% or more water and are not liquids when gelled. This is another absolutely clear example of a mater with water in it at much higher concentrations than the maximum 30% of Berg that is not a liquid. As Jello® brand desserts are gelled, as are the particles of Berg, this analogy is quite meaningful. The gelatin product holds sharp edges and is not a liquid. The Berg particles may contain 30% water, but are clearly solids (as further arguments will show), and cannot reshape themselves by surface tension because the particles are solids (not liquids) and retain their shape.

Similarly water of hydration is held in salts (e.g., cupricsulfate-5H_2O) and is present in an amount over 35% by weight of the salt and remains a hard solid. It is absolutely clear that the presence of more than 30% water in a composition does not mean the composition is a liquid as recited in the claim. **The sole basis for finding anticipation in the rejection by the assumption that all materials containing 30% water is in error as a matter of science and fact.** As Berg clearly describes and treats his particles as a solid, there is no room for reinterpretation of the reference by erroneous assumptions to asserts that what Bergs describes as a solid is being interpreted as a liquid to enable rejection of the claims.

As pointed out later herein, Berg grinds his particles in a mill to get size and shape control (see Figure 9). This is clear evidence that the particles of Berg are solid, in spite of the erroneous conjecture and poor science reasoning applied in this rejection.

Berg produces fixed shape, grindable particles, while the claims require and recite that a liquid is expelled:

> "...g) ejecting the liquid mixture volumes from the cell sheet by subjecting the liquid mixture solution contained in each cell to an impinging jet of fluid wherein the impact of the impinging jet of fluid dislocates the liquid mixture volumes from the cell sheet thereby forming independent mixture solution lump entities;...'

a liquid must be expelled, not merely a solid containing a component which, under certain temperature conditions, would be a liquid (water).

It is critical to appreciate that Berg retains 30% by weight of **water** in the material, not 30% liquid, and the claims recite that a liquid is ejected from the mold and that surface tension reshapes the ejected liquid into a sphere. As Berg forms a solid, treats the particles as solids 9e.g., grinding them), they cannot be asserted to be liquids.

It is the position of Applicant that if these scientific facts are considered with respect to the recitation of the claims, the rejection will clearly and absolutely be found in error.

PREVIOUS BUT ENHANCED ARGUMENTS REGARDING THIS REJECTION

Further and more importantly, Berg teaches that "the (mold) cavity may be the inverse of even other solid geometric shapes, such as, for example, pyramidal, frusto-pyramidal, <u>truncated spherical</u>, <u>truncated spheroidal</u>, conical, and frusto-conical" (Column 6, lines 35-47). In accordance with the broadest reasonable interpretation of the term "spherical" in the instant claim language, Bergs formation of truncated <u>spherical</u> particles anticipates applicants formation of "independent spherical entities".

This is a misinterpretation of the word **<u>"SPHERICAL"</u>.**

In **Berg,** Col 11, L24, he states "If an abrasive particle is prepared in a mold cavity having a pyramidal, conical, frusto-pryamidal, frusto-conical, truncated spheroidal shape, the thickness is determined as follows....(L35) in the case of a truncated sphere or truncated spheroid, the thickness is the length of a line perpendicular to the center of the base of the truncated sphere or truncated spheroid and running to the curved boundary of the truncated sphere or truncated spheroid". This **<u>shows that the "base" is flat and planar</u>** (hence the "perpendicular") in all cases which is totally different than a full-curvature sphere that has no "base." A truncated spheroid is not spherical.

When a sphere is truncated it is cut into half (or less) sections to form a hemisphere, or even a sphere-cap that has a very limited thickness relative to its diameter. The ONLY types of dispersion "spheroids" (as defined by Berg) are formed out of a single thickness cavity sheet into which he forms (machines) his cavities into the sheet from only one side of the sheet, or completely-through the sheet thickness . He **can not machine-form a spherical cavity inside a thin sheet**. If he did form a spherical cavity inside the sheet thickness he would neither be able to fill this cavity with dispersion or remove the solidified dispersion sphere as there would be no openings from the sphere

cavity to either surface side of the cavity sheet. **BERG does not enable formation of a spherical particle and therefore cannot anticipate or render that term obvious.**

For reference, in the Oxford English Dictionary (**OED**), 2004 "**truncate**", v. is "**To shorten or diminish by cutting off a part; to cut short; to maim, mutilate".** Also the OED defines "**truncated**", ppl. a as "Of a figure: Having one end cut off by a transverse line or plane; esp. of a cone or pyramid: **Having the vertex cut off by a plane section**; esp. one parallel to the base; thus **truncated cone or pyramid=FRUSTUM** of a cone or pyramid.".

Berg states that, **and to enable functionality for his process**, his dispersion must be solidified before removal from the cavities in order for the ejected particles to retain the same shape they had as they resided within the cavities; and that the amount of liquid that is removed in this step is 40% or less to achieve this solidification. It is very clear that the removal of 40% of the liquid from the dispersion produces solidified particles, is intended t o produce **solidified particles**; and must produce solidified particles to function according to the disclosure. Therefore these particles do not have a liquid state and therefore are not subject to internal surface tension forces that would re-form them into spherical shapes. **The Berg particles are not liquid, whatever their liquid content. They are solidified and do not anticipate the claims.**

At Column 7, lines 45ff **Berg** states:

> "A **sufficient amount** of the volatile component **MUST BE** removed from the dispersion to **bring about SOLIDIFICATION** thereof, thereby forming a precursor of an abrasive particle having approximately the **same shape as the shape of the mold cavity**." Further, at Col 7, L53 it is stated "**Typically, up to 40% of the LIQUID is removed from the dispersion...**" (**emphasis** added)

As Berg solidifies his material, that material cannot anticipate the limitation in the claims that is recited in Claim 2:

"**ejecting the liquid mixture volumes** from the cell sheet by **subjecting the liquid mixture solution** contained in each cell to an impinging jet of fluid wherein the impact of the impinging jet of fluid **dislocates the liquid mixture volumes** from the cell sheet thereby forming independent mixture solution lump entities;..." **(emphasis added)**

Berg's "rounding" is simply meant "to break-off a sharp edge" as in to "round it off". In the Oxford English Dictionary (OED), 2004 "round", v. is "to make round, convex, or curved by trimming off edges or angle; to cut off (points, etc.) so as to make round."; and "to become round, circular, OR spherical; to grow or develop to a full round form.". Also (OED), 2004 refers to "rounding", vbl. n. as "a rounded edge or surface; a curvature; a curved part or outline; a tonsure". None of these definitions refer to "rounded" as being exclusively "spherical" and the process shown by Berg **cannot** form a sphere. Such a result of a spherical particle is impossible from the actual methods taught by Berg and there is no motivation to alter the process of Berg and no direction on how to alter the process of Berg to form spherical particles.

PLEASE NOTE THE FIRST PARAGRAPH IN THE DETAILED DESCRIPTION OF THE INVENTION OF BERG (Highlighting added)

"As used herein, the term "dispersion" means the composition that is introduced into the mold cavity--the composition will be referred to as a dispersion until **sufficient volatile component is removed therefrom to bring about solidification of the dispersion; the term "precursor of abrasive particle" means the unsintered particle produced by removing a sufficient amount of the volatile component from the dispersion, when it is in the mold cavity, to form a solidified body having a shape corresponding approximately to the shape of the mold cavity**; the term "abrasive particle" means the

sintered particle produced by the process of this invention."

There can be absolutely no debate. Berg forms a **solid** in the mold cavity, or his use of the term "solidification" is being ignored or distorted.. There is absolutely no teaching in Berg that a liquid can be retained in the cavities and expelled from the cavities. It is purely tortured reasoning that the presence of 30% water in the particles, and because water can be a liquid, that the particles therefore are a liquid. This position is absolutely wrong and the rejection is fatally flawed. There can be no argument, analysis, analogy or interpretation of Berg to assert that solidification includes allowing a liquid to remain a liquid as recited in the present claims on appeal.

It is the position of Applicant that if these scientific facts are considered with respect to the recitation of the claims, the rejection will clearly and absolutely be found in error.

Additionally, there is absolutely no teaching in Berg of step g) of claim 2 and the equivalent limitation in claim 11:

> g) ejecting the liquid mixture volumes from the cell sheet **by subjecting the liquid mixture solution contained in each cell to an impinging jet of fluid wherein the impact of the impinging jet of fluid dislocates the liquid mixture volumes** from the cell sheet thereby forming independent mixture solution lump entities; (**emphasis** added)

There is no disclosure in Berg that teaches this step, especially as it is applied to a liquid mass that is ejected from the cells.

This is a separate and second basis upon which Berg (alone and in combination with other references of record) fail o teach the invention as a whole.

Each and every rejection based upon Berg must also be reversed on this second ground or argument.

There are clearly numerous and repeated failures in the disclosure of berg to even act as a basis for these rejections.

THE ATTEMPT TO CITE ZHAI et al. AS A TEACHING OF THE INHERENTNCY OF SPHERICITY IN BERG OR THE ABILITY TO RENDER BERG'S PARTICLES SPHERICAL

First, the citation of Zhai et al. is not a teaching of inherency, but rather is a teaching of what is purported to be operational modifications that can be performed to render a sol-based particle more round. That citation is legally inapplicable to a rejection under 35 USC 102(b) and any content of Zhai used to suggest changes in Berg are not acceptable in the rejection under 35USC102(b) and would not be useful in a rejection under 35USC103(a) even if so cited.

Secondly, because of the fundamentally different nature of the processes of Berg and Zhai and the compositions and objectives of Berg and Zhai, inherency is not established. Thirdly, the only way to combine the teachings of Berg and Zhai is to dramatically change the objectives, parameters and process of Berg, which is incompatible with a rejection under 35 USC 102(b).

Zhai Article.

Zhai's article subject process is a **SPRAY PELLETIZATION** or **GRANULATION** process which is a **completely different process** from the **COLLOIDAL GELATION** processes of both Berg and the present invention. Zhai forms his large-sized composite agglomerates from two different small-sized and spherical shaped dried oxide powders because these same small powders can not be successfully used directly for thermal spraying applications. The small sized dual-oxide powders act like dust in the thermal spray process and can't be applied properly to the intended target surface areas. Further,

the very smallest oxide powders have a tendency to separate from the larger different-oxide powders, which could cause the thermal spray to apply a coating of either one oxide material or the other. Here, the desired thermal spray coating is a combination of the two different oxide materials.

Zhai's process starts with two different sized and different-material preformed spherical solid oxide balls, mixes them with water and a dispersant, mills them aggressively, adds a binder and again mills the mixture aggressively. He then uses a high speed rotary-wheel spray drier to form enlarged spheres of the composite mixture. The formed spheres are then dried by a heated air atmosphere which evaporates the liquids from the bodies of the agglomerate spheres. Upon liquid evaporation from the spherical formed pellets (granules) that contain the composite previously-solidified oxide spheres, the different individual oxide spheres that form the spherical pellets bond to each other. Each of the resultant spray-pelletization formed individual enlarged agglomerates consists essentially of a few of the larger spherical particles of one oxide material that are surrounded with many of the very small spherical particles of the other oxide material. For each spherical pellet, the small oxide spheres are in direct surface contact with the large oxide spheres. The resultant large diameter agglomerate spheres have two different (material and size) oxides that are bonded together sufficiently well that they can be used in a thermal spraying operation to apply a uniform coating of both oxides to a workpiece surface.

In **Chapter 25 titled "Granulation" by Malcolm Summers and Michael Aulton in the book "Pharmaceutics, 2nd Edition"**, edited by Michael Aulton, ISBN 0443055173, Harcourt-International, Pg 364-378, a full description of the process of forming large sized granules from solidified spheres of two different materials having different sphere sizes is made. Pictorial illustrations of the "ball growth" of these enlarged granules from the smaller constituent spheres are clearly shown in various Figures by Summers and Aulton. For instance, Fig. 25.1 "Granulation to prevent powder segregation", Pg 365,

shows the granulation of two different powders into Monosized granules and why the powders are granulated to prevent separation into segregated powders. Fig. 25.2 "Water distribution between particles of a granule during formation and drying", Pg 368, shows how liquids are positioned relative to the solid constituent spheres during the processes of forming and drying the granules. Fig. 25.3 "Mechanisms of ball growth during granulation", Pg 370, shows different mechanisms of forming the monosized granules.

When a colloidal dispersion is gelled, the colloidal organic or inorganic particles join together in strings to form fibrous branches that are interconnected into a single lattice-network entity where many of the fibers contact each other. This formation of interconnected fibrous branches during colloidal gelling is well known to those skilled in the art where the gelled product is referred to as a sol-gel.

In an article "Physics...Physics and Chemistry; Electromagnetism; Quantum Mechanics; Group Theory; The Hodograph, Colloids: the fascinating properties of matter that is all surface", Pg 1-12, by Dr James B. Calvert of the University of Denver, CO., the formation of Gels from colloidal mixtures is described. On Pg 9, L21 it is stated:

> **"the system *gels*,** forming a **wobbly** but definitely **solid body."** On Pg 9, L33 he states: "The colloidal phase in a gelatin **is fibular,** composed of **fibers of colloidal cross-section**. When a gel set, these fibers form a **tangled mass like a pile of brush**, that holds the system together."

In Section 3 titled "Sol-gel chemistry and engineering background" Subsection 3.3 "Gelation, aging, drying and firing" in the University of Bordeaux, France Class notes titled "Introduction to Hybrid Organic-Inorganic Materials (12h)" by Etienne Duguet. Pictorial illustrations of the "branched cluster" of colloidal sols that are gelled are shown in Fig. 2, Pg 3-9 "Polymer growth and gel formation in acid-catalyzed systems (polymeric gel)" and in Fig. 4 "Polymer growth and gel formation in base-catalyzed systems (colloidal gel)."

In an April 6, 2004 article "Silca Aerogels: How Silica Aerogels are Made" by M. Ayers from the Ernest Orlando Lawrence Berkeley National Laboratory, CA., a description of an Alcogel is given on L19, "Alocgel (wet gel)" and on L21 "An alcogel consists of two parts, a solid part and a liquid part. The solid part is formed by the three-dimensional network of linked oxide particles. The liquid part (the original solvent of the Sol) fills the free space surrounding the solid part"

In an article titled "Simulations of sol gel materials" by Lev David Gelb Research Group Home Page at Washington University in St. Louis, Mo., modified Sep 25, 2006, pages 1-13, a number of schematic morphologies and micrographs of sol gels are shown on page 3 (Adapted from Brinker and Scherer, Sol Gel Science, chapter 9, figures 3a-3d). These figures clearly show the formation of branches of particles where the braches are joined together to form gelled clusters.

These figures clearly show that the granulation (pelletization) process of **Zhai** which forms large sized spherical balls is **totally different** than the colloidal dispersion and sol-gel fibrous forming drying **process of Berg. THEREFORE, ZHAI CANNOT ESTABLISH ANY BASIS FOR INHERENCY AND ITS COMBINATION WITH BERG AS A TEACHING OF WHAT IS INHERENT IN BERG IS CLEAR LEGAL ERROR.**

Furthermore, as Berg is now clearly established as different from Zhai and that there is no inherency in the ability or actuality of sphere formation, and because Berg requires solidification before particle formation in a mold that cannot provide spheres, the rejection has been shown to be clearly in error and the rejection must be withdrawn.

Berg forms a matrix of interconnected oxide particle fibrous branches **DURING GELLATION** that assume his mold cavity shape during his drying process. There is **NO FIBROUS GELLATION of Zhai's** mixture during his drying process as his already-solid oxide spheres are simply joined together to form spherical composite

granules. As Berg cannot use a spherical three-dimensionally circular mold in his process, but at most can form a hemisphere, and because the particles are ejected as solids while the claims recite ejection as a liquid, the rejection is factually and legally in error.

The % wt of water that is present in Zhai's mixture that allows his rotary wheel spray formation of spherical agglomerates, due to surface tension forces and the fluidity of the mixture, is unique to his mixture of pre-existing solid oxide spheres and water and a binder liquid. It is pure speculation **and not inherency** that the same % wt of water that exists in another unlike dispersion mixture that is comprised of non-solid and non-dried-oxide materials (such as the dispersion mixture in the present invention) would have the same fluidity and reaction to surface tension forces. It is certainly the case that another dispersion mixture unlike Zhai's dispersion mixture, having the same % wt of water, that has already been solidified within a mold cavity before ejection from the cavity (Berg's dispersion), has no capability to be acted upon by surface tension forces to form spherical shapes from the ejected dispersion entities after they are ejected from the individual cavities. Surface tension forces do not act upon solidified entities because they are not liquids. Surface tension forces only act upon entities that are in a liquid state and that have sufficient fluidity to be reshaped by the surface tension forces. Minute rectangular shaped liquid entities having very high viscosities will not form spherical entity shapes in a short period of process time when only acted upon by surface tension forces.

Zhai's high speed rotary spray drier imposes high shearing action forces on his mixture to provide the **purportedly** spherical shapes. Zhai is very careful to provide a dispersion mixture that readily shear-thins to provide these agglomerate beads. His shear-thinned mixture has an extremely high viscosity in the absence of shearing action on the mixture. This zero-shear high viscosity would tend to prevent the

formation of spherical shapes of the mixture by surface tension forces alone if no external shear force is applied to the mixture.

By comparison, in the present invention, there are no external shearing forces that are applied to a lump of dispersion mixture that has been ejected from a screen cell into a drying environment where the dispersion entity lumps a are simply SUSPENDED in the drying (dehydration) environment.

In Berg the dispersion mixture is completely different than the Zhai dispersion. Berg's dispersions are colloidal mixtures of oxide material particles that are suspended in water. When these mixtures are partially dried, the individual oxide material particles join together in strings to form branches that are interconnected and woven together. <u>These oxide particles of Berg are NOT JOINED TOGETHER into solidified spherical oxide shapes as is the case for the Zhai spheres</u> that are the starting basis for the Zhai mixture. **When sufficient water is removed from the Berg mixture entities as they remain in the mold cavities, the mixture gels, and forms a single-entity lattice network, at which time the mixture completely looses its fluidity and conforms to the shape of the mold, which is never a sphere**. The mixture mass is no longer acted upon by surface tension forces in a manner that the entities can be reshaped by the surface tension forces. Berg continues to dry or dehydrate the dispersion entities as they remain in the cavities to assure that the entities retain the mold cavity sharp-edged shapes after the entities are ejected from the cavities. The sharp edges on the ejected entities that were formed by the mold cavities are retained throughout further drying and heat treatment process steps that convert the entities into abrasive particles. These sharp edges on the abrasive particles form the cutting edges of the abrasive particles. If these abrasive particles do not have their sharp edges they are useless for abrading purposes. **At no time is a liquid particle ejected from the mold. Berg fails to teach this fundamental and critical step. Every argument in the rejection attempts to assert and prove that a**

solidified mass that retains its shape is a liquid. THAT IS ERROR ON ITS FACE.

A more detailed discussion of Zhai's pelletization process as compared to Berg is given in the following:

Zhai starts with both oven-dried perfectly spherical solid AL_2O_3 and small TiO_2 beads. He mixes them with water and a dispersant, and ball mills this mixture for 4 hours; adds a polyvinyl alcohol (PVA) binder and ball mills the new mixture for an additional 4 hours to form a slurry mixture. He then uses a centrifugal spray drier to form bigger composite beads from this slurry.

A description of Zhai's oxide spheres is given starting at the last word of Pg 1, "Both of the sub-micron AL_2O_3 powders and the nanostructured TiO_2 powders were **PEFECTLY SPHERICAL** in shape. The AL_2O_3 powders have a mean particle size of about 0.6 μm in diameter (a distribution of 0.3-1 μm), and the TiO_2 powders have an average size of about 30 nm in diameter (a distribution of 5-80 nm)."

A description of **Zhai's <u>oven drying the individual oxide spheres</u> prior to mixing** is given on PG 2, Col 1, L 21, "The starting AL_2O_3 and the TiO_2 powders were **OVEN DRIED AT 120 °C** for 10 h to remove any absorbed water moisture on the surface before being blended in the weight ratio of 97 and 3 % respectively." (emphasis added)

a) **Zhai's** article was **published** almost **2 years after the original filing date of the present application, so its failing to be an actual teaching of inherency also destroys its ability to be used in combination with Berg in a rejection under 35 USC 103(a).**

b) In **Zhai,** a oxide mixture having only 30% water allows surface tension forces to form spherical beads. However, this is not a dehydrated and reacted mass as taught by Berg, but rather is a suspension of pre-existing spherical particles in a water carrier medium. This clearly shows that there **CANNOT BE ANY TEACHING OF**

INHERENCY IN BERG FROM THE TEACHINGS OF ZHAI. THEYE ARE DIFFERENT IN VAST NUMBERS OF WAYS AND THERE CANNOT BE ANY SCIENTIFIC BASIS OF INHERENCY BETWEEN THE REFERENCES.

c) The Examiner concludes (from Zhai's spheres formed by surface tension acting on 30% liquid slurry) that Berg's slurry mixture having 40% liquid will also be acted upon by surface tension to form spheres. He states that it is therefore obvious to create abrasive spheres from Berg's open-cell cavities. That is complete error. An assumption is made that different amounts of materials, treated differently, under different conditions, with different additional additives, will act the same when it is the intent and result of each disclosure to in fact act differently.

Further Differences Between Zhai and Berg that Obviate Inherency

1) Zhai starts exclusively with: already-formed and **dried** perfectly-**spherical** AL_2O_3 and small TiO_2 beads and ball mill mixes them together for 4 hours with water to form a slurry. Even though they are perfectly round beads to start with, Zhai still has to mill them very aggressively for long times to successively get them dispersed in the water.

2) Berg starts with a dispersion mixture of: $\mathbf{AL_2O_3}$ precusor particles and water and molds them within a flat surfaced mold to provide specifically molded shapes to the particles.

3) Zhai adds a binder, e.g., polyvinyl alcohol (**PVA**), to his ball milled dispersion of solid spherical beads and ball mills this new mixture for additional 4 hours.

A description of <u>Zhai's use of a liquid binder</u> and states that his is a SPRAY PELLETIZATION process given on PG 2, Col 1, L 12, "Polyvinyl alcohol (PVA) and n-butanol were used as binder and antifoam agent, respectively. The **PVA was used for bind strength between particles**.....so that the agglomerated powders were easily prepared and avoided to break in the process of SPRAY PELLETIZATION."

Berg does **not use** a **Binder** and his is **<u>not a SPRAY PELLETIZATION process.</u>**

4) Zhai ball mills his mixture for long periods of time. Zhai produces a dispersion mixture, having a special additive (PVA), that has a high solids content that still remains fluid by using Ball Milling for long periods of time (8 hours). This is a very tedious and aggressive form of mixing. It is critical to Zhai that his dispersion remain fluid and particularily that the fluid has a dispersion of separate particles. Berg does not ball mill his dispersion, he simply uses a continuous mixer to make a solution of AL_2O_3 abrasive precursor and water and then reacts and solidifies metal oxides within molds.

5) Zhai's dispersion mixture is distinctly unique and very likely to have good fluidity because of this uniqueness and the need to keep the particles dispersed so that they may form a core-shell structure of center spheres and coating spheres. Almost all of the volume of his mixture is composed of the 0.6 avg. micrometer AL_2O_3 beads (97% wt) and little volume is composed of the small 0.03 avg. micrometer TiO_2 beads (3%) that coat the surface of the larger spheres. Zhai's dispersion is somewhat analogous to collecting a bunch of glass marbles together with a few tiny glass beads and mixing the marble and beads with water and a binder. It takes very little wt % of liquid to result here in a dispersion that has good fluidity. This is especially the case when the dense marbles and beads are "perfectly spherical" and; were even pre-dried to assure that the marble and bead smooth surfaces are completely dry before mixing. These adjacent solid spheres have good natural freedom to freely move relative to one and another especially because the bulk of the mixture is made up of marbles that are so large relative to the small beads (20:1 size ratio). Collectively they can individually roll about each other much as would individual ball bearings in a bucket of ball bearings. But this again is totally different from Berg so that any assertion of inherency is untenable on its face.

Berg starts with a dispersion mixture of: AL_2O_3 precusor particles and water. Only single particles are used, the single particle is not spherical, no coating of particles

surfaces with other different particles occurs. Berg solidifies his particles in the absence of significant shear and solidified particles are ejected.

6) Zhai uses a high speed centrifugal rotary wheel spray drier that applies a high shear to his liquid dispersion. A description of Zhai's use of a rotary wheel spray drier is on PG 2, Col 1, L 34, "After the slurry preparation was completed, spray drying was used to make agglomerated reconstitution powders. The reconstitution process was carried out by a high-speed centrifugal spray drier.". Here, this mixture fluid is highly sheared as it moves along the wall surfaces of the high speed centrifugal drier wheel. [The spray drier in 6,645,624 (Adefris), Col. 6, L24 operates at 25,000 to 45,000 rpm.] This shearing action accelerates the fluid whereby it is ejected into a drying air atmosphere as individual ligament streams that travel at a great velocity. Particles are not ejected as recited in the claims. As these curvilinear high speed dispersion ligament streams contact the heated stationary air, the streams decelerate with high shearing action and break into individual dispersion entities. Both surface tension and air friction shearing forces act upon these moving dispersion entities to form his desired spherical composite-oxide spheres.

The oxide dispersion described by Zhai is subjected to very significant shearing forces in the spray drying pelletization process where the dispersion entities are formed into spherical shapes. In **Zhai's Fig. 3** "Effect of binding content on the rheological behavior of AL_2O_3/TiO_2 ceramic slurry: (a) viscosity curves and (b) flow curves" he shows that his shear-thinned slurry has a viscosity of only 0.02 Pa.s att high shear and in excess of 10.0 Pa.s at zero-shear. The zero-shear condition occurs at rest or when a slurry droplet is suspended in a fluid as is the case in the instant invention. The Zhai viscosity here changes by a factor of 500: 1.

In an article "EXPERIMENTAL STUDY AND NEURAL NETWORK MODELING OF THE LIGAMENT DISINTEGRATION IN ROTARY ATOMIZATION" published in Atomization and Sprays, Vol. 12, pp.107-121, 2002 by

Stephan Sternowsky and Gunther Schulte, University of Bremen, Bremen, Germany the formation of ligament streams of a liquid and the formation of spherical droplets is described. Fig. 2, Pg 111 "(a) Ligament formation and breakup (seen from above). (b) Sketch of ligament path." shows how a liquid exits a high speed rotary wheel in a ligament stream with high tangential speed and also high radial speed, where the stream breaks up as it is decelerated by air and forms the stream into individual spheres.

Berg simply introduces his dispersion mixture into stationary mold cavities and solidifies the molded dispersion entities while they reside in the cavities. He takes great care to assure that the mold cavity shaped entities are solidified so that they will individually retain the cavity shapes after they are separated from the cavities so that his separated abrasive precusor particles have the required particle sharp edges that are needed to perform abrasive cutting actions. It would be a functional disaster for him if his sharp-edged cavity-separated particles were deformed by surface tension forces that rounded-off his mold-shaped sharp particle edges.

As can be seen, the process of Berg and Zhai are dramatically different, there is absolutely no basis for asserting any degree or type of inherency in the product of Berg from the teachings of Zhai, and Zhai is not available as a reference, if tried to be combined with Berg.

7) Zhai optimizes the % quantity of both the Dispersant and the Binder PVA to provide a low viscosity, shear-thinning slurry mixture of the solid oxide spheres for the creation of spherical composite beads using the centrifugal spray drier. Zhai deliberately formulates the dispersant and binder to ASSURE creating a shear thinning fluid mixture which would have a low viscosity at high shear rates.

Zhai REQUIRES the addition of the PVA Binder agent to enable the formation of spherical beads. Just because he achieves adequate shear-thinned fluidity from his unique mixture of solidified oxide spheres and water to allow spherical beads to be produced under very high fluid shear process conditions, this does not mean that Berg's

dispersion is sufficiently fluid that it would be acted on by surface tension after ejection from his non-spherical cavities to form spherical bead shapes. Additionally, Berg requires that the composition be solidified within the mold. This is antithetic to remaining a liquid. Berg's material is intended to retain its shape without restraint, which in contradictory to the very definition of a liquid.

Berg does not desire a shear-thinning dispersion mixture that assumes and retains the shapes of his mold cavities. He even prefers that the mixture is the opposite whereby it is gelled, to prevent surface tension from re-forming the assumed cavity shapes of the ejected slurry entities.

8) Zhai references the wt % solids in his dispersion. He starts with dried perfectly-spherical AL_2O_3 beads and small TiO_2 beads. He then adds water and binder liquids to form his dispersion. The wt % amount of liquid or solids that he references for his pre-sprayed dispersion is related to the liquid that was added to his solid oxide spheres during the mixing process and not to the remaining liquid after drying as in the case of Berg. **Berg** starts with particles of an aluminum oxide monohydrate (boehmite) and simply collects the already-solidified ejected particles for further high temperature heat treatment processes. Zhai does not heat-treat his spheres, he simply dries them for final thermal spraying use.

Before addressing the specific limitations in the claims that clearly distinguish the novelty of the present invention as claimed from the disclosure of Berg, it is believed to be worthwhile to compare the background technology of Berg versus the nature of the invention provided in the present Application. These subsequent arguments are substantially similar to those previously presented in the past correspondence. **It must be noted that a major point of error in the rejection is the repeated assertion that "solidified" materials of Berg that are intended to and must retain their shapes in the absence of a restraining environment are being asserted as a liquid. That**

assertion is contrary to the most basic definitions used in Physics and Chemistry for the properties of a liquid.

BERG

Berg manufactures individual sharp–edged abrasive particles directly from precursor aluminum oxide material. To produce the abrasive particles the disclosure teaches filling sheet cavity through-holes with an alpha alumina precursor dispersion mixture solution to manufacture hardened abrasive particles having sharp edges from the alpha alumina. Some of the sheets have flat-surfaced through-hole cavities that provide sharp edges to the dispersion entities that are contained in the level-filled sheet cavities. The volume of each of the liquid-state dispersion entities is equal to the contained-volume of the corresponding individual cavity holes.

The entity geometric shapes are initially established when the entities are formed by the mold cavities. The ejected shrunken entities have the same shapes as the mold cavities; the same-shape entities are just smaller than before they were shrunk. The cavity holes act as molds to shape each individual entity with entity-flat surfaces that intersect each other at angles that are approximately 90 degrees, or less, to form sharp knife-like edges at the intersections of the flat surfaces of each entity. The abrasive precursor entities are then solidified while they are in residence within the confines of the mold cavities so that most of the individual dispersion entities retain all of their sharp edges <u>after</u> they are ejected from the cavity molds. <u>**The shapes must retain these sharp edges as that is the function and intended purpose of the Berg process**</u>.

During the process of solidification of the dispersion entities by drying, while they reside within the cavity molds, the dispersion experiences significant shrinkage due to the loss of water from the dispersion as a result of the drying process. The Berg dispersion typically loses 40% of the water during the in-cavity drying process. The shrunken entity, however, retains and must retain the general geometric shape of the non-

shrunken entity, especially including the sharp entity edges. Because the shrunken dispersion entity is now smaller than the mold due to this shrinkage, gravity alone provides a sufficiently large force on the shrunken entities that they freely fall out of the mold cavities. Berg also describes the use of a "low pressure" to aid in the entity ejection from the mold cavities. It is important to the reference that the ejected dispersion entities retain the sharp entity edges and general entity geometric configurations after entity ejection.

Some further entity shrinkage after mold ejection takes place during the calcining and sintering heat treatment steps. The hardened abrasive particles that are produced by this mold cavity process are used directly as abrasive particles that still have the same shape as their mold-ejected entities. The mold-formed sharp edges are used to cut away workpiece material when these hardened entities are in abrading contact with a workpiece. These hardened abrasive particles are coated as-is on abrasive articles; they are not broken or crushed prior to coating to develop new sharp cutting edges prior to coating on an abrasive article.

There is of course absolutely no teaching in Berg of using "excessive" ejection forces to dislodge particles. Such a teaching would be destructive of the intent of Berg to form particles of specific functional shapes to enable his technology. If significantly large ejection forces are applied to his dispersion entities to dislodge them from the mold cavities with **any effective result** that the sharp edges of the individual dispersion entities become rounded, the resultant non-sharp rounded edges would lose the abrasive cutting capability that is the objective of Berg. It is well established that it cannot be obvious to destroy the benefits and function taught by a reference for no benefit, and it is further unreasonable to assert that it is inherent that excessive forces would be used that destroy the function of the reference, with the sole purpose being to meet the limitation of the pending application. The edge-rounding of the ejected particle of Berg would have to be a single one-time event that occurs at the time that the particle is ejected from the mold

cavity, as once the semi-hardened shape had been obtained, no other forces are likely to occur to reshape the molded shape of the ejected particles. No such forces are taught by Berg.

It is to be further noted that any of the Berg indicated "Rounding" of some (only) of the sharp edges of the dispersion precursor entities can occur when a through-hole mold cavity is filled to an overflowing condition is not a teaching of the formation of a **spherical particle as recited in claim 2. Merely rounding the edges of a sharp edged shaped particle, in which sharp edges are an objective of the Berg teaching is not the provision of a spherical particle.**

In this *de minibus* teaching of Berg, an undesirable part of the dispersion extends past the sharp cavity-shape delineation edges onto the flat between-hole surface of the cavity sheet. Even though the main body of dispersion entity that is contained in the mold cavity shrinks away from the cavity walls prior to ejection, the overflow-portion of the dispersion entity extends along the sheet surface in an overhanging fashion to form a thin lip that extends out from the body of the entity. Because the thin lip extends past the cavity opening, gravity does not supply enough force to fracture this overhanging lip to allow the shrunken entity to freely drop out of the mold cavity. Berg's application of a low pressure only to the near-side (pressure side) of the sheet cavities results in an entity ejection force that is applied externally only to the near-side of the dispersion entity that is retrained from freely passing through a mold cavity through-hole. The application of entity ejection pressures is a single-event occurrence. This externally-applied pressure force breaks off the thin overhanging dispersion lip from the dispersion entity body thereby rounding- off the entity body but only at the locations of the over hanging lips. **This does not produce anything that anyone skilled in the art would consider to be a spherical particle as recited in claim 2.** The reduced-size body at these lip sites allows the dispersion entity to pass through the cavity opening. All of the non-lip edges of the

entities are not rounded during this entity ejection event. The entity is thus ejected from the cavity **as a non-spherical particle**.

Little, if any, further rounding of the particle edges occurs after the particle is ejected from the mold cavity, and **even any theoretical further rounding is not taught or suggested to destroy the sharp-edged desired structure of Berg to form the spherical particles claimed in claim 2.** The particle ejection forces are no longer applied to the individual ejected particles after ejection. After an entity is separated from the mold cavity structure even application of "high pressure" will not cause further rounding of the entity edges. Here, the ejected entity is already in a substantially solid state.. Any post-ejection applied pressures will not preferentially "chip away" any portion of the solid entity to form it into a spherical shape, and because of the substantially solid state of the particles, moderate time frame external pressures would not reshape the particles to spherical shapes. Ejected sharp-edged precursor solidified entities would remain sharp (and not become rounded) as the sharp edge is required by Berg to produce hardened abrasive particles that individually have many sharp cutting edges. It is unreasonable to assume that Berg allows within his disclosure the operation of process parameters that would destroy the objective of his technology.

The rejections assumption of an extreme case where the rounding effect is presumed, where the entity "assumes" the shape of a sphere and this spherical entity is hardened, all of the cutting edges are lost on this hardened entity. That would destroy the functionality and purpose and disclosed benefit of Berg, and is not taught or inherent in Berg. Also, the sizes of these extreme "spherical" shapes would be random in size. The rounded shaped particles would be smaller in size than the original particles because of the edge material removal during the rounding event. Coating these hard smooth-surfaced spherical shaped aluminum oxide aluminum oxide particles on a backing sheet would not produce an abrasive article that could effectively abrade a workpiece surface "as is."

BACKGROUND OF DUESCHER

A liquid dispersion mixture comprised of oxide material and water is level-filled in sheet cavity through-holes to establish the controlled volumetric size of each dispersion entity. When the liquid-state dispersion entities having non-spherical shapes are ejected from the mold cavities using a fluid jet, the ejected liquid dispersion entities individually assume spherical shapes due to surface tension forces acting on the entitles. If the ejected non-spherical entities were already solidified, as is the case with Berg, then surface tension forces would not re-form the solidified entities into spheres because, in part, solidified entities do not have surface tension forces. Spherical entity shapes are formed from the non-spherical liquid entities that are ejected from the cavities. The non-ejected entities can not have spherical shapes because the level-filling action on the dispersion filled cell through-holes produces flat surfaces on each entity that resides in the cell holes. Spherical entity shapes are formed by the surface tension forces independent of the geometric shape that each mold cavity has. For instance, rectangular or circular mold cavity shapes will both produce a liquid spherical dispersion entity when these flat surfaced liquid entities are acted on by surface tension forces.

Surface tension forces are not "applied forces" that are applied to the external surface of an ejected liquid dispersion entity. Rather, they simply exist within the fluid body. They originate as an artifact of the entity having a liquid-state. Also, surface tension forces do not act on a dispersion entity that is located within a cavity in a manner that would eject the entity from the cavity.

These internal surface tension forces are not to be confused with the external applied fluid-jet forces that are directed to a single external surface of the dispersion entity as it resides in the through-hole cavity. As a fluid jet impinges on the near-side (fluid jet side) of the sheet cavities, a resultant fluid dynamic force is applied externally to the near-side of the dispersion entity. This fluid jet force ejects the dispersion entity out

of the cavity whereby the entity exits the far-side of the cavity.

Claim 2, as amended recites:

"...h) wherein the ejected independent liquid mixture solution lump entities are shaped into independent spherical entities by force comprising liquid mixture solution surface tension;

i) the independent spherical entities are introduced into and subjected to a solidification environment wherein the independent spherical entities become solidified to form loose, green, spherical beads; and

j) firing the loose, green, spherical beads at high temperatures to produce beads."

It can be seen from these limitations that the claims recite "spherical particles" (which are not disclosed by Berg as shown in the above arguments, and that liquid entities are ejected from the compartments, which is also clearly not shown by Berg. The claims also recite that the ejected liquid is shaped into a sphere by at least surface tension, again a step not taught by berg. Berg has been clearly shown to fail to teach the totality of limitations of claim 2 as presented above. Neither claim 2 nor any claim dependent therefrom can be rejected under 35 USC 102(b) and this rejection must be withdrawn.

Claim 11 cannot be rejected under 35 USC 102(b) over Berg for the same or similar reasons described above with respect to claim 2. Claim 11 recites:

"...e) mixing materials into a liquid solution, the liquid mixture solution comprising abrasive particles, an inorganic vitrifiable oxide[;] or a combination of inorganic vitrifiable oxides, and water or solvents or a combination thereof;

f) filling the cell sheet holes with the liquid mixture solution to form mixture volumes wherein the volume of mixture solution contained in each mixture volume is equal to the cell sheet volume; i) ejecting the liquid mixture volumes from the cell sheet by subjecting the mixture

> solution contained in each cell to an impinging jet of fluid wherein the impact of the impinging jet of fluid dislocates the <u>liquid</u> mixture volumes from the cell sheet thereby forming independent <u>liquid</u> mixture solution lump entities;
>
> <u>g)</u> wherein the ejected independent <u>liquid</u> mixture solution lump entities are shaped into independent spherical entities by <u>at least</u> mixture solution surface tension forces;"

<u>Because of the presence of these limitations, the claims cannot be rejected as proposed in the Office Action.</u> The rejection must be withdrawn.

Applicants further disagree with respect to the rejection of claim 11 under this provision with respect to the comments made by the rejection with regard to the green state. Applicants also not, for the record, at this time, that green has no required meaning of color, but refers to the art-recognized green state of inorganic oxides. Green agglomerates are formed when enough water is removed from the dispersion to form agglomerates that do not stick to each other. Sources of this statement are described in the present specification and are listed here:

> **1.** "<u>Water is removed</u> from the dispersed slurry and surface tension draws the slurry into spheroidal composites <u>to form</u> <u>green composite abrasive granules</u>." (pg 31, L22ff).
> **2.** "The dehydrated <u>green composite</u> generally comprises a metal oxide or metal oxide precursor, volatile solvent, e.g., water, alcohol, or other fugitives and about 40 to 80 weight percent equivalent solids, including both matrix and abrasive, and the solidified composites are dry in the sense that they <u>do not stick to one another</u> and will retain their shape." (pg 31, L28ff).
> 3. "<u>Agglomerate</u> beads are solidified into <u>green state</u> spherical shapes <u>when the water</u> component of the water-based slurry agglomerate <u>is drawn out</u> at the agglomerate surface by the dehydrating liquid or by the heated air." (pg 146, L20ff).

In addition, <u>Berg</u> states that "It is <u>preferred</u> that a sufficient amount of <u>volatile</u> component be <u>removed</u> from the dispersion <u>so</u> that the precursors of the abrasive <u>particles</u>

can be easily removed from the cavities of the mold. Typically, up to 40% of the liquid is removed from the dispersion in this step. At this point the precursors of the abrasive particles are sufficiently nonsticky that they will not stick to one another when they are removed from the mold" (C7, L19ff).

The rejection refers to Berg in a way that is somewhat askew of the issue. The Berg description at (C7, L46-58) does not result in the stated interpretation stated as: "Typically, the precursors of the abrasive particles will be dried (outside of the mold".

Instead, the (C7, L46-58) statement is, as written:

> "The precursors of the abrasive particles **can be** further **dried outside of the mold**. If the dispersion is dried to the desired level in the mold, this additional drying step is not necessary. However, in some instances it may be economical to employ this additional drying step to minimize the time that the dispersion resides in the mold. During this additional drying step, care must be taken to prevent cracks from forming in the precursors of the abrasive particles. Typically, the precursors of the abrasive particles will be dried for from about 10 to 480 minutes, preferably from 120 to 400 minutes, at a temperature from about 50°C. to about 160°C., preferably from about 120°C. to about 150°C." (emphasis and underlining added)

The Berg dispersion particles are in a green state when they are dehydrated sufficiently to **solidify** and to shrink enough to drop out of his mold cavities and where they retain their sharp particle edges. As they are in a green state at the time that they are ejected from the cavities, they cannot thereafter be converted to a green state.

PLEASE NOTE THE FIRST PARAGRAPH IN THE DETAILED DESCRIPTION OF THE INVENTION OF BERG (Highlighting added)

> "As used herein, the term "dispersion" means the composition that is introduced into the mold cavity--the composition will be referred to as a dispersion until **sufficient volatile component is removed therefrom to bring about solidification of the dispersion; the term "precursor of abrasive particle" means the unsintered particle produced**

> **by removing a sufficient amount of the volatile component from the dispersion, when it is in the mold cavity, to form a solidified body having a shape corresponding approximately to the shape of the mold cavity**; the term "abrasive particle" means the sintered particle produced by the process of this invention."

There can be absolutely no debate but that Berg forms a solid in the mold cavity. There is absolutely no teaching in Berg that a liquid can be retained in the cavities and expelled from the cavities. It is purely tortured reasoning that the presence of 30% water in the particles, because water can be a liquid under certain circumstances, that the particles therefore are a liquid. This position is absolutely wrong and the rejection is fatally flawed.

PATENTABILITY OF THE DEPENDENT CLAIMS UNDER EXAMINATION

3) Claims 4 and 13 have been rejected under 35 U.S.C. 103(a) as unpatentable over Berg in view of Howard for the same reasons as the rejections of Claims 2 and 11.

This rejection is in error for the same reasons given above for the failure of the rejection of claims 2 and 11. The Howard reference does not correct the clear and substantive deficiencies of Berg. The assertion that Howard is instructive that "dehydrating liquid is commonly practiced and well known in the art" is immaterial to the correction of the deficiencies of Berg. As Berg is solidifying particles, it does not matter how that solidification is done, since the claims recite the removal of liquid material from the mold as recited in claim 2 as:

> "...ejected independent liquid mixture solution lump entities are shaped into independent spherical entities by force comprising liquid mixture solution surface tension forces..."

These limitations are not taught by the combination of Berg in view of Howard.

4) Claims 5 and 14 have been rejected under 35U.S.C. 103(a) as unpatentable over Berg (5,984,988) in light of Eisenberg (4,393,021) and in further view of the rejections of Claims 2 and 11.

All rejections of claim dependent from claims 2 and 11 in this rejection are inherently defective for the reasons given above with respect to the failure of Berg to teach the limitations in totality of claims 2 and 11. No additional reference in this rejection has been cited as showing reasons for destroying the function and purpose of Berg that differentiates Berg from the claims subject matter of claims 2 and 11. In the absence of such a specific teaching, this rejection must fail at least for this reason.

Additionally, Eisenberg cannot be combined with Berg without destroying the objectives of Berg. It would not be possible to substitute an Eisenberg woven screen for berg's mold belt to manufacture Berg's dispersion entities. The cells formed by the individual interleaved wire strands in the woven screen are interconnected with adjacent cells. The cells "appear" to be separated by the wire strands as viewed from the top flat surface of the screen. However, the actual screen thickness results from the composite thickness of individual wires that are bent around perpendicular wires where the screen thickness is often equal to three times the diameter of the woven wires. Adjacent "cell volumes" are contiguous across the joints formed by the perpendicular woven wires. Level-filling the screen with Berg's dispersion creates adjacent cell dispersion entities that are joined together across these perpendicular wire joints. When Berg dries his screen-cell entitles, the entities shrink and some entities would pull themselves apart from each other at the screen joints. However, the entity shrinkage will not be sufficient that the non-joined solidified entities will pass through the screen openings. The entities will remain lodged in the screen mesh as trapped by the portions of the entity bodies that extended across the woven wire joints. Berg can not use a woven screen to process his dispersion entities.

5) Claims 7 and 16 have been rejected under 35U.S.C. 103 (a) as unpatentable over Berg (5,984,988) in light of Culler (6,521,004) and the Quadro Engineering Incorporated Comil® product description.

All rejections of claim dependent from claims 2 and 11 in this rejection are inherently defective for the reasons given above with respect to the failure of Berg to teach the limitations in totality of claims 2 and 11. No additional reference in this rejection has been cited as showing reasons for destroying the function and purpose of Berg that differentiates Berg from the claims subject matter of claims 2 and 11. In the absence of such a specific teaching, this rejection must fail at least for this reason.

There is also a further defect in the teaching of Culler that prevents this rejection form establishing obviousness. **Berg** level fills mold cavities with a liquid dispersion and **solidifies** the dispersion by drying **prior to ejecting** the dispersion cavity entities from the cavities. The shapes of the ejected Berg particles are not changed after ejection. Also, the solidified entities are **not spherical** in shape.

Culler extrudes a mixture of abrasive particles into **filaments** that are solidified and then **broken** into abrasive agglomerate **particles**. The solidified entities are not spherical in shape. Neither the Berg nor Culler processes, or a combination of the Berg and Culler processes, produce ejected liquid abrasive particle filled abrasive dispersion entities that can be acted on by surface tension forces to form the entities into spherical shaped entities. There is no other disclosed mechanism that can be used with the Berg or Culler processes that can produce equal sized spherical abrasive agglomerate beads.

It also would not be obvious to modify Berg's belt mold by substituting Culler's cone screen and impeller. Provision must be made to dry Berg's dispersion entities while they reside in the mold cavities for them to assume the sharp edged three dimensional shape of the cavities before they are ejected. Culler extrudes his dispersion filaments that break off at random lengths which are then hardened and fractured into abrasive particles.

Furthermore, it would not be obvious to incorporate (sharp) diamond particles into the erodible matrix material of the Berg invention according to the teachings of Culler. It is not possible or desirable to incorporate individual diamond abrasive particles into solidified hardened aluminum oxide abrasive particles.

6) Claims 9 and 10 have been rejected under 35U.S.C. 103(a) as unpatentable over Berg (5,984,988) (listed as 6,521,004, Culler?) in view of Mathews (3,838,998).

All rejections of claim dependent from claims 2 and 11 in this rejection are inherently defective for the reasons given above with respect to the failure of Berg to teach the limitations in totality of claims 2 and 11. No additional reference in this rejection has been cited as showing reasons for destroying the function and purpose of Berg that differentiates Berg from the claims subject matter of claims 2 and 11. In the absence of such a specific teaching, this rejection must fail at least for this reason.

Additionally, the Matthews reference provides capability that essentially teaches against the possibility of combination with Berg. Berg's process produces solid dispersion entities that are solidified prior to ejection from the mold. The addition of Mathew's bloating agent to Berg's dispersion will not produce solidified hollow beads that are formed while the entities are located in the molds. The particles will still retain the shape of the mold cavities. Berg depends upon his dispersion entities shrinking while they are located in the mold cavities in order that they freely drop out of the cavities. The bloating agent would instead expand the individual entities and prevent their ejection from the Berg mold.

To form equal sized hollow beads, it is necessary to form equal volume entities that are made from a dispersion that contains a "chemical agent" that forms a gas upon heating, ejecting these liquid entities from the mold cavities and then subjecting the now-spherical shaped entities to high temperatures. The high temperatures form the hollow spheres and also vitrify the beads to produce glassy surfaces.

7) Claims 9 and 10 have been rejected under 35U.S.C. 103(a) as unpatentable over Berg (5,984,988) in view of Cai (Phys Rev Lett. 2202 Dec:89(23):235501.) Cai indicates that "gamma-alumina is known to transform to theta-alumina and finally to alpha-alumina upon thermal treatment. It is asserted to be obvious to choose gamma-alumina as taught by Cai from the Claim 18 material list to be converted into alpha alumina in the thermal treatment set by Berg.

All rejections of claim dependent from claims 2 and 11 in this rejection are inherently defective for the reasons given above with respect to the failure of Berg to teach the limitations in totality of claims 2 and 11. No additional reference in this rejection has been cited as showing reasons for destroying the function and purpose of Berg that differentiates Berg from the claims subject matter of claims 2 and 11. In the absence of such a specific teaching, this rejection must fail at least for this reason.

8) Claims 19 and 20 Rejected under 35U.S.C. 103(a) as unpatentable over Berg (5,984,988) in view of Culler (6,521,004).

All rejections of claim dependent from claims 2 and 11 in this rejection are inherently defective for the reasons given above with respect to the failure of Berg to teach the limitations in totality of claims 2 and 11. No additional reference in this rejection has been cited as showing reasons for destroying the function and purpose of Berg that differentiates Berg from the claims subject matter of claims 2 and 11. In the absence of such a specific teaching, this rejection must fail at least for this reason and the other reasons given above with respect to Culler.

All rejections of claim dependent from claims 2 and 11 in this rejection are inherently defective for the reasons given above with respect to the failure of Berg to teach the limitations in totality of claims 2 and 11. No additional reference in this rejection has

been cited as showing reasons for destroying the function and purpose of Berg that differentiates Berg from the claims subject matter of claims 2 and 11. In the absence of such a specific teaching, this rejection must fail at least for this reason.

9) Claim 21 has been rejected under 35U.S.C. 103(a) as unpatentable over Berg (5,984,988) in view of in view of Ramanath (5,834,569).

All rejections of claim dependent from claims 2 and 11 in this rejection are inherently defective for the reasons given above with respect to the failure of Berg to teach the limitations in totality of claims 2 and 11. No additional reference in this rejection has been cited as showing reasons for destroying the function and purpose of Berg that differentiates Berg from the claims subject matter of claims 2 and 11. In the absence of such a specific teaching, this rejection must fail at least for this reason.

Additionally, it would not be obvious to incorporate Ramanath's color-coding scheme to the abrasive particles of the Berg process to produce spherical abrasive agglomerate beads.

Additional Comments

The reference to the Howard teachings in the rejections is non-instructive assertion that liquid extraction would further render obvious the process of the claims. It would not be obvious to solidify Berg's abrasive precursor entities in Howard's dehydrating liquid. Berg's mold cavities would have to be filled with the liquid dispersion and then the mold would have to be submerged in the liquid to solidify and shrink the dispersion entities while the entities reside in the mold cavities. There are many unknown technology issues related to the processes of solidifying, shrinking and ejecting the solidified entities while submerged in a liquid environment as compared to the simple Berg-described processes that take place in a heated air environment. There

are further potential process complications related to a liquid system in general. These include the application of pressure forces to dislodge submerged cavity-trapped entities, the collection of submerged ejected entities, the separation of the liquid from the entities and the facility provision of liquid process equipment that handles explosive liquids or hot oils.

It is speculation that the substitute use of a liquid environment provides any attractive benefits as compared to the Berg hot air environment that would make it obvious to substitute a liquid dehydrating system for Berg's hot air system.

The final fault in this reference is that no matter how liquid is extracted from the materials of Berg while they are in the cavities, they will then retain their **necessary and required sharp-edged state**. **<u>Liquids, as recited in the claims, do not retain shape unless confined</u>**. The reference and resulting process would still not meet the limitations argued above with respect to the lack of teaching of removal of liquid mass from cavities, subsequent spheroidal shaping, and subsequent green state formation. The Howard reference cannot correct the underlying defects of the Berg reference.

CONCLUSION

All rejections of record have been shown in detail to be in error. The rejection should be reversed and all claims should be indicated as allowable.

Applicants believe the claims are in condition for allowance and request reconsideration of the application and allowance of the claims. The Examiner is invited to telephone the below-signed attorney at 952-832-9090 to discuss any questions that may remain with respect to the present application.

Respectfully submitted,
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I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to Box: APPEAL BRIEF - PATENTS, P.O. BOX 1450; Commissioner for Patents, Alexandria, VA 22313-1450 on OCTOBER 23, 2007.

Name: Mark A. Litman

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Signature

CLAIMS APPENDIX

1. (WITHDRAWN) A flexible abrasive sheet disk article comprising: a) a backing sheet comprising a polymer; b) the backing sheet having a disk shape, the disk shape having an outer radius; c) the disk shape having an annular distribution of abrasive on a surface, the annular distribution having an inner radius of an abrasive coated annular band that is less than 85% of an outer radius of the abrasive coated annular band; d) the annular distribution of abrasive comprising at least a monolayer of abrasive particles or composite erodible abrasive agglomerates, the at least a monolayer being resin bonded onto the surface of the disk backing sheet; and e) an outer annular border gap area located between the outer radius of the coated abrasive annular band of coated abrasive and an outer radius of the disk article, the gap area being free of coated abrasive wherein the border gap area has a radial width of from 0.1% to 10.0% of the abrasive disk article radius.

2. (PREVIOUSLY PRESENTED) A process of making spherical beads comprising:

a) using a cell sheet wherein the cell sheet has a array of cell sheet through holes;

b) the cell sheet through holes each have a cross sectional area;

c) the cell sheet having a nominal thickness;

d) the cell sheet holes form cell sheet volumes wherein a cell sheet volume is equal to the cell sheet through hole cross sectional area multiplied by the cell sheet thickness;

e) mixing materials into a liquid solution, the mixture solution comprising an inorganic oxide or a combination of inorganic oxides, and water, solvents or a combination thereof;

f) filling the cell sheet holes with the liquid mixture solution to form mixture volumes wherein the volume of mixture solution contained in each mixture volume is equal to the cell sheet volume;

g) ejecting the liquid mixture volumes from the cell sheet by subjecting the liquid mixture solution contained in each cell to an impinging jet of fluid wherein the impact of the impinging jet of fluid dislocates the liquid mixture volumes from the cell sheet thereby forming independent mixture solution lump entities;

h) wherein the ejected independent liquid mixture solution lump entities are shaped into independent spherical entities by force comprising liquid mixture solution surface tension forces;

i) the independent spherical entities are introduced into and subjected to a solidification environment wherein the independent spherical entities become solidified to form loose, green, spherical beads; and

j) firing the loose, green, spherical beads at high temperatures to produce beads.

3. (ORIGINAL) The process of claim 2 wherein the solidification environment comprises elevated temperature air or other gas.

4. (ORIGINAL) The process of claim 2 wherein the solidification environment is a dehydrating liquid.

5. (ORIGINAL) The process of claim 2 wherein the cell sheet is a woven screen.

6. (ORIGINAL) The process of claim 2 wherein the cell sheet is joined at two opposing ends to form a cell sheet continuous belt.

7. (ORIGINAL) The process of claim 2 wherein the cell sheet comprises a disk shape

having an annular pattern of cell sheet holes.

8. (ORIGINAL) The process of claim 2 wherein the green beads are fired at a temperature sufficiently high to vitrify the bead exterior surfaces, wherein the vitrified bead surfaces are glassy surfaces.

9. (PREVIOUSLY PRESENTED) The process of claim 2 wherein the mixture solution comprises chemical agents selected from the group consisting of gas inducing material~~,~~ thereby providing spherical shaped hollow beads.

10. (ORIGINAL) The process of claim 9 wherein the spherical shaped hollow beads are fired at a temperature sufficiently high to vitrify the agglomerate exterior surfaces, wherein the vitrified bead surfaces are glassy surfaces.

11. (PREVIOUSLY PRESENTED) A process of making spherical abrasive agglomerates comprising:

a) using a cell sheet wherein the cell sheet has a array of cell sheet through holes;

b) the cell sheet through holes each have a cross sectional area;

c) the cell sheet having a nominal thickness;

d) the cell sheet holes form cell sheet volumes wherein a cell sheet volume is equal to the cell sheet through hole cross sectional area multiplied by the cell sheet thickness;

e) mixing materials into a liquid solution, the liquid mixture solution comprising abrasive particles, an inorganic vitrifiable oxide or a combination of inorganic vitrifiable oxides, and water or solvents or a combination thereof;

f) filling the cell sheet holes with the liquid mixture solution to form mixture volumes wherein the volume of mixture solution contained in each mixture volume is equal to the cell sheet volume; i) ejecting the liquid mixture volumes from the cell sheet by subjecting the mixture solution contained in each cell to an impinging jet of fluid wherein the impact of the impinging jet of fluid dislocates the liquid mixture volumes from the cell sheet thereby forming independent liquid mixture solution lump entities;

g) wherein the ejected independent liquid mixture solution lump entities are shaped into independent spherical entities by at least mixture solution surface tension forces;

h) the independent spherical entities are introduced into and subjected to a solidification environment wherein the independent spherical entities become solidified to form loose green agglomerates; and

i) firing the green agglomerates at high temperatures to produce spherical abrasive agglomerates.

12. (ORIGINAL) The process of claim 11 wherein the solidification environment comprises elevated temperature air or other gas.

13. (ORIGINAL) The process of claim 11 wherein the solidification environment is a dehydrating liquid.

14. (ORIGINAL) The process of claim 11 wherein the cell sheet is a open cell woven screen.

15. (ORIGINAL) The process of claim 11 wherein the cell sheet is joined at two opposing ends to form a cell sheet continuous belt.

16. (ORIGINAL) The process of claim 11 wherein the cell sheet comprises a disk shape having an annular pattern of cell sheet holes.

17. (ORIGINAL) The process of claim 11 wherein the green agglomerates are fired at a temperature sufficiently high to vitrify the agglomerate exterior surfaces, wherein the vitrified agglomerate surfaces are glassy surfaces.

18. (ORIGINAL) The process of claim 11 wherein the mixture solution material includes at least one metal oxide or non-metal oxide selected from the group consisting of silica, alumina, titania, zirconia, zirconia-silica, magnesia, alumina-silica, alumina-boria-silica, alumina and boria, boria and mixtures thereof.

19. (ORIGINAL) The process of claim 11 wherein the spherical abrasive agglomerates comprise diamond or cubic boron nitride particles bound in an erodible matrix material.

20. (PREVIOUSLY PRESENTED) The process of claim 11 wherein the spherical abrasive agglomerates having number average abrasive particle diameter sizes of from 0.1 to 10 micrometers are encapsulated together with oxide materials to form erodible composite agglomerates having spherical abrasive agglomerate number average diameter sizes of from 20 to 60 micrometers.

21. (ORIGINAL) The process of claim 11 wherein the abrasive agglomerates comprise coloring agents, wherein the coloring agents are used to identify the size of the abrasive particles contained in a abrasive agglomerate wherein a specific color correlates to specific contained particle size.

22. (WITHDRAWN) A flexible abrasive sheet article comprising a flexible backing sheet having a flat surface area coated with at least a monolayer of the abrasive agglomerates of claim 11 supported in a polymeric resin.

23. (WITHDRAWN) The article of claim 22 wherein the abrasive sheet article is a lapping film.

24. (WITHDRAWN) The process of claim 23 wherein the workpiece is an optical device.

25. (WITHDRAWN) The process of claim 24 wherein the optical device is a fiber optic component.

26. (WITHDRAWN) A process of surface-conditioning the abrasive articles of claim 22 wherein the surfaces of abrasive agglomerates attached to the flexible backing sheet having an initial average height of abrasive agglomerates, the process comprising providing relative motion between the abrasive article abrasive surface and a surface conditioning apparatus, the surface conditioning apparatus having a flat contact surface, wherein the surface conditioning apparatus flat contact surface is in pressure contact with the article abrasive surface and wherein the surface conditioning apparatus flat contact surface dynamically contacts and breaks away individual coated abrasive agglomerates that are resin bonded in a position elevated above the initial average height of the abrasive agglomerates from the surface of the abrasive article, thereby providing approximately a monolayer of abrasive agglomerates resin bonded to the abrasive article.

27. (WITHDRAWN) The process of claim 24 wherein the surface condition apparatus flat contact surface comprises an abrasive surface.

28. (WITHDRAWN) A flexible abrasive sheet article comprising a flexible backing sheet having an array of spaced, shaped, raised abrasive coated island foundation structures, the abrasive coated island foundation structures comprising islands of a first structure material having a raised top surface, the raised island top surface having at least a monolayer of the abrasive agglomerates of claim 11 supported in a polymeric resin.

29. (WITHDRAWN) A process of surface-conditioning the abrasive articles of claim 28 wherein the surfaces of abrasive agglomerates supported by resin on the island structures having an initial average height of abrasive agglomerates, the process comprising providing relative motion between the abrasive article abrasive surface and a surface conditioning apparatus, the surface conditioning apparatus having a flat contact surface, wherein the surface conditioning apparatus flat contact surface is in pressure contact with the article island abrasive surfaces and wherein the surface conditioning apparatus flat contact surface dynamically contacts and breaks away individual coated abrasive agglomerates that are resin bonded in a position elevated above the initial average height of the abrasive agglomerates from the surface of the abrasive article, thereby providing approximately a monolayer of abrasive agglomerates resin bonded to the article raised islands.

30. (WITHDRAWN) An abrasive article wherein the standard deviation of the average size of the spherical abrasive agglomerates is less than 20% of the average abrasive agglomerate size.

31. (WITHDRAWN) An abrasive article wherein the standard deviation of the average size of the spherical abrasive agglomerates is less than 10% of the average abrasive agglomerate size.

EVIDENCE APPENDIX

No extrinsic evidence has been submitted that must be considered in this Appeal.

RELATED PROCEEDINGS APPENDIX

There are no related proceedings on appeal or in any judicial body of which the Attorney of Record or the Applicant are aware that would have any direct bearing on the issues in this Appeal.